Complete Summary

GUIDELINE TITLE

Atrial fibrillation.

BIBLIOGRAPHIC SOURCE(S)

Institute for Clinical Systems Improvement (ICSI). Atrial fibrillation. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2004 Nov. 60 p. [103 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previously released version: Atrial fibrillation. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2003 Oct. 64 p.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

- Atrial fibrillation (A Fib)
- Atrial flutter (A Flutter)

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Prevention

Risk Assessment
Treatment

CLINICAL SPECIALTY

Cardiology
Emergency Medicine
Family Practice
Internal Medicine

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Health Care Providers
Health Plans
Hospitals
Managed Care Organizations
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To improve the consistency of anticoagulation in patients with paroxysmal, persistent or permanent atrial fibrillation/atrial flutter (A Fib/Flutter)
- To improve rate control in patients with permanent A Fib
- To increase the percentage of patients with A Fib/Flutter who receive patient education

TARGET POPULATION

Adults with first detected episode and recurrent (paroxysmal, persistent or permanent) atrial fibrillation (A Fib) and atrial flutter (A Flutter)

INTERVENTIONS AND PRACTICES CONSIDERED

Diagnosis

1. 12-lead electrocardiogram (ECG)
2. Assessment for hemodynamic stability
3. Echocardiography
4. Chest x-ray
5. Computed tomography (CT) of chest
6. Coronary/pulmonary angiography
7. Thyroid function tests
8. Cardiology or electrophysiology consult as needed
9. Evaluation for potentially reversible causes of atrial fibrillation (A Fib), comorbidities, risk factors for bleeding, risk factors for thromboembolism, and other special situations such as recent surgery, acute myocardial infarction,

preexcitation, hypertrophic cardiomyopathy, pulmonary diseases, hyperthyroidism, or pregnancy

Management/Treatment

1. Observation/reevaluation
2. Electrical (DC) cardioversion
3. Antiarrhythmic/chemical cardioversion
4. Patient education (discussion groups, pamphlets, classes, tapes, videos) regarding A Fib disease process, symptoms, treatment options, risks, drug interactions
5. Rate control agents: atenolol (Tenormin); metoprolol (Lopressor); propranolol (Inderal); esmolol (Brevibloc); verapamil; diltiazem (Cardizem); digoxin (Lanoxin); clonidine; digoxin in combination with calcium channel blocker or beta-blocker
6. Antiarrhythmic agents: quinidine; procainamide; disopyramide (Norpace), flecainide (Tambocor), propafenone (Rythmol), amiodarone (Cordarone), sotalol (Betapace), ibutilide (Corvert), dofetilide (Tikosyn)
7. Acute and/or chronic anticoagulation: warfarin and unfractionated heparin (UFH)
8. Radiofrequency catheter ablation
9. Internal cardioversion
10. Balloon valvuloplasty
11. Percutaneous transluminal coronary angioplasty (PTCA)
12. Pericardiocentesis
13. Septal ablation (alcohol or surgical)
14. Pulmonary embolectomy
15. Coronary bypass or valve replacement/repair
16. Catheter based ablative therapies such as HIS-bundle ablation and permanent pacemaker implantation; atrial flutter ablation; and pulmonary vein isolation for atrial fibrillation suppression
17. Cardiac pacing, such as single- or dual-site atrial pacing and implantable cardioverter defibrillator
18. Surgical treatment with maze or modified maze procedure

MAJOR OUTCOMES CONSIDERED

- Rates of cardioversion
- Symptom control
- Rate and rhythm control
- Rates of recurrence of atrial fibrillation (A Fib) or flutter
- Adverse effects of treatments
- Risk of thromboembolic complications or stroke or fatal bleeding

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Additional descriptions of literature search strategies are not available.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Key conclusions (as determined by the work group) are supported by a conclusion grading worksheet that summarizes the important studies pertaining to the conclusion. Individual studies are classed according to the system presented below, and are designated as positive, negative, or neutral to reflect the study quality.

Conclusion Grades:

Grade I: The evidence consists of results from studies of strong design for answering the question addressed. The results are both clinically important and consistent with minor exceptions at most. The results are free of any significant doubts about generalizability, bias, and flaws in research design. Studies with negative results have sufficiently large samples to have adequate statistical power.

Grade II: The evidence consists of results from studies of strong design for answering the question addressed, but there is some uncertainty attached to the conclusion because of inconsistencies among the results from the studies or because of minor doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from weaker designs for the question addressed, but the results have been confirmed in separate studies and are consistent with minor exceptions at most.

Grade III: The evidence consists of results from studies of strong design for answering the question addressed, but there is substantial uncertainty attached to the conclusion because of inconsistencies among the results of different studies or because of serious doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from a limited number of studies of weak design for answering the question addressed.

Grade Not Assignable: There is no evidence available that directly supports or refutes the conclusion.

Study Quality Designations:

The quality of the primary research reports and systematic reviews are designated in the following ways on the conclusion grading worksheets:

Positive: indicates that the report or review has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis.

Negative: indicates that these issues (inclusion/exclusion, bias, generalizability, and data collection and analysis) have not been adequately addressed.

Neutral: indicates that the report or review is neither exceptionally strong nor exceptionally weak.

Not Applicable: indicates that the report is not a primary reference or a systematic review and therefore the quality has not been assessed.

Classes of Research Reports:

A. Primary Reports of New Data Collection:

   Class A:

   - Randomized, controlled trial

   Class B:

   - Cohort study

   Class C:

   - Nonrandomized trial with concurrent or historical controls
   - Case-control study
   - Study of sensitivity and specificity of a diagnostic test
   - Population-based descriptive study

   Class D:

   - Cross-sectional study
   - Case series
   - Case report

B. Reports that Synthesize or Reflect upon Collections of Primary Reports:

   Class M:

   - Meta-analysis
   - Systematic review
   - Decision analysis
   - Cost-effectiveness analysis

   Class R:

   - Consensus statement
   - Consensus report
   - Narrative review

Class X:

- Medical opinion

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Clinical Validation-Pilot Testing
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Institute Partners: System-Wide Review

The guideline annotation, discussion, and measurement specification documents undergo thorough review. Written comments are solicited from clinical, measurement, and management experts from within the member groups during an eight-week review period.

Each of the Institute's participating member groups determines its own process for distributing the guideline and obtaining feedback. Clinicians are asked to suggest modifications based on their understanding of the clinical literature coupled with their clinical expertise. Representatives from all departments involved in implementation and measurement review the guideline to determine its operational impact. Measurement specifications for selected measures are developed by the Institute for Clinical Systems Improvement (ICSI) in collaboration with participating member groups following implementation of the guideline. The specifications suggest approaches to operationalizing the measure.

Guideline Work Group

Following the completion of the review period, the guideline work group meets 1 to 2 times to review the input received. The original guideline is revised as necessary, and a written response is prepared to address each of the responses received from member groups. Two members of the Cardiovascular Steering Committee carefully review the input, the work group responses, and the revised draft of the guideline. They report to the entire committee their assessment of four questions: (1) Is there consensus among all ICSI member groups and hospitals on the content of the guideline document? (2) Has the drafting work group answered all criticisms reasonably from the member groups? (3) Within the knowledge of the appointed reviewer, is the evidence cited in the document current and not out-of-date? (4) Is the document sufficiently similar to the prior edition that a more thorough review (critical review) is not needed by the member group? The committee then either approves the guideline for release as submitted or negotiates changes with the work group representative present at the meeting.

Pilot Test

Member groups may introduce the guideline at pilot sites, providing training to the clinical staff and incorporating it into the organization's scheduling, computer, and other practice systems. Evaluation and assessment occur throughout the pilot test phase, which usually lasts for three-six months. At the end of the pilot test phase, ICSI staff and the leader of the work group conduct an interview with the member groups participating in the pilot test phase to review their experience and gather comments, suggestions, and implementation tools.

The guideline work group meets to review the pilot sites' experiences and makes the necessary revisions to the guideline, and the Cardiovascular Steering Committee reviews the revised guideline and approves it for release.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The recommendations for atrial fibrillation (A Fib) are presented in the form of an algorithm with 21 components, accompanied by detailed annotations. An algorithm is provided for Atrial Fibrillation; clinical highlights and selected annotations (numbered to correspond with the algorithms) follow.

Class of evidence (A-D, M, R, X) and conclusion grade (I-III, Not Assignable) definitions are repeated at the end of the "Major Recommendations" field.

Clinical Highlights

There are five key steps in the management of patients with A Fib or atrial flutter (A Flutter) ("SALT-E"): stabilize, assess, label, treat, and educate.

After confirming the diagnosis of A Fib or A Flutter with a 12-lead electrocardiogram (ECG) (Annotation #2):

1. Stabilize
    a. Assess for hemodynamic instability (hypotension, angina, uncompensated congestive heart failure [CHF], or end-organ dysfunction). (Annotation #4)
    b. Treat hemodynamic instability with emergent direct current (DC) cardioversion and obtain an emergent cardiology or internal medicine consult. (Annotation #4)
    c. Establish adequate rate control. (Annotation #4)
2. Assess

    a. Assess for potentially reversible causes of A Fib/A Flutter, comorbidities, risk factors for thromboembolism, risk factors for bleeding, and special situations (cardiomyopathy, pulmonary disease, hypothyroidism, or pregnancy). (Annotation #5)
3. Label

    a. Label (classify) patients into 1 of 4 categories:
        - First Detected Episode, Duration Known <48 hours
        - First Detected Episode, Duration Known ≥48 hours or Duration Unknown
        - Recurrent A Fib
            - paroxysmal
            - persistent
            - permanent
        - Recurrent A Flutter

    Treatment options are determined by these 4 categories. (Annotation #6)

4. Treat
    a. First Detected Episode, Duration Known <48 Hours
        - Patients with first known episode of A Fib or A Flutter with duration known to be less than 48 hours and without a history of rheumatic heart disease or thromboembolism can be observed or treated with electrical cardioversion without anticoagulation. Chemical cardioversion can also be used, but is less effective than electrical cardioversion. (Annotation #8)

    b. First Detected Episode, Duration Known ≥48 Hours or Duration Unknown
        - Patients with stable A Fib or A Flutter with duration greater than 48 hours or duration unknown require appropriate anticoagulation (international normalized ratio [INR] ≥2.0) for 3 weeks prior to electrical cardioversion or use of antiarrhythmics/chemical cardioversion. (Annotation #10)

    c. Recurrent A Fib
        - Patients with paroxysmal, persistent, or permanent A Fib require assessment for chronic anticoagulation (risk of thromboembolism compared with risk of bleeding) (Annotation #12) and adequate rate control (Annotation #13)
        - Patients with persistent symptoms despite adequate rate control may require intermittent cardioversion, antiarrhythmic

agents, and/or electrophysiology consultation. (Annotation #18)

d. Recurrent A Flutter
   - Patients with recurrent A Flutter should be referred for an electrophysiology consultation. (Annotation #18C)

5. Educate

   Patient education is a critical component in the management of all patients with A Fib/A Flutter. (Annotation #21)

Atrial Fibrillation Algorithm Annotations

Atrial Fibrillation/ Atrial Flutter (A Fib/A Flutter) Diagnosis and Treatment

1. Patient Presentation: Symptoms or Physical Findings Consistent with A Fib/A Flutter or Incidental ECG Finding

   Key Points:

   - A Fib or A Flutter can be symptomatic or asymptomatic even in the same patient.

   A. Symptoms or physical findings consistent with A Fib or A Flutter.
      - palpitations
      - chest pain
      - dyspnea
      - fatigue
      - lightheadedness
      - confusion
      - syncope - syncope is a rare but serious complication that usually indicates a sinus node dysfunction, an accessory atrioventricular (AV) pathway, valvular aortic stenosis, hypertrophic cardiomyopathy (HCM), or cerebrovascular disease.

      Physical findings may include:

      - irregular pulse
      - congestive heart failure (CHF)
      - hypoxia
      - thromboembolism

2. Electrocardiogram (ECG) Confirms A Fib and/or A Flutter?

   ECG is essential to the diagnosis and treatment of A Fib or A Flutter.

   ECG characteristics of Atrial Fibrillation

A Fib is characterized by disorganized rapid atrial activity (greater than 350 beats per minute [BPM]) and may be either coarse or fine. Ventricular complexes are irregular.

ECG characteristics of Atrial Flutter

A Flutter is an organized reentrant rhythm, which is characterized by quite regular atrial activity (flutter or F waves) which form a saw tooth pattern that is most prominent in ECG leads II, III, and AVF. Atrial rates are typically between 240-320 BPM in the untreated state, but can slow significantly with antiarrhythmic drug therapy. Ventricular rates can be either regular or irregular. Regular rates are commonly about 150 beats per minute with a 2:1 atrioventricular (AV) block. Atypical A Flutter is also quite regular, but may differ in flutter wave morphology and rates. It is usually seen in patients who have had prior surgical atriotomies, particularly for correction of congenital heart disease.

Atrial flutter can degenerate into Atrial Fibrillation, A Fib can initiate A Flutter, or the ECG patterns can alternate between A Flutter and A Fib.

The distinction between Atrial Fibrillation and Atrial Flutter is particularly important in that typical Atrial Flutter can be easily ablated. See Annotation #18 "Referral for Treatment Options," section on Electrophysiology Consult for more information.

AV Node Conduction (A Fib/A Flutter)

Ventricular response to Atrial Fibrillation and Atrial Flutter depends on the ability of the AV node to conduct electrical impulses to the ventricle. AV nodal conduction is affected by intrinsic properties of the AV node, parasympathetic (vagal) inputs, sympathetic (adrenergic) inputs, drugs that depress AV nodal conduction such as beta-blockers, calcium blockers and digoxin and drugs that may enhance conduction.

Associated Cardiac Conditions That May Influence Therapy

The electrocardiogram should also be examined for other underlying cardiac conditions, which may influence choice of therapy:

- preexcitation
- bundle branch block
- left ventricular (LV) hypertrophy
- acute myocardial infarction (MI)
- prior acute MI
- QT prolongation
- P-wave duration and morphology or fibrillatory waves
- other atrial arrhythmias

4. Stabilize Patient

Key Points:

- Hemodynamically unstable patients represent a unique group who often have underlying structural or electrical cardiopulmonary disease.
- Hemodynamically unstable patients require hospitalization and emergent consultation from a physician with cardiology expertise, and if indicated, emergent DC cardioversion.

A. Hemodynamic stabilization

Hemodynamically unstable patients may exhibit the following symptoms:

- hypotension
- myocardial ischemia
- uncompensated CHF
- altered mental status
- end-organ dysfunction
- clinical deterioration

These patients represent a unique group who often have underlying structural or electrical cardiopulmonary disease including Wolff-Parkinson-White (WPW) syndrome, severe stenosis of the mitral or aortic valves, hypertrophic obstructive cardiomyopathy, cardiac tamponade/pericarditis, severe coronary artery disease or pulmonary embolism.

Additional evaluation of patients with A Fib/A Flutter presenting with hemodynamic instability may include:

- emergent echocardiography
- computed tomography (CT) scan of the chest
- coronary/pulmonary angiography

Hemodynamically unstable patients require hospitalization and emergent consultation from a physician with cardiology expertise, and if indicated, emergent cardioversion.

Additional urgent treatments may include:

- radiofrequency catheter ablation
- internal cardioversion
- balloon valvuloplasty
- percutaneous transluminal coronary angioplasty (PTCA)
- pericardiocentesis
- septal ablation (alcohol or surgical)
- pulmonary embolectomy
- coronary bypass or valve replacement/repair

The role of anticoagulation prior to and following emergent cardioversion remains controversial. Intravenous unfractionated heparin and warfarin may be considered in:

- patients who have been in A Fib for a few days and then develop hemodynamic instability
- patients in whom recurrent A Fib is likely because of past experience
- patients with mitral valve disease
- patients who following cardioversion demonstrate spontaneous echo contrast in the left atrium or left atrial appendage

Heparin should be continued until the INR is >2.0 consecutive days. There is no experience reported on the use of low-molecular-weight heparins following cardioversion.

For more information on anticoagulation, refer to the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement (ICSI) Anticoagulation Therapy Supplement guideline.

Evidence supporting this recommendation is of classes: C, R

B. Acute Rate Control

Adequate rate control may help relieve symptoms including palpitations, chest pain, dyspnea, fatigue, or lightheadedness. Patients with acute MI or acute coronary symptoms require lower ventricular rates to decrease myocardial oxygen demand and limit the infarction size.

Acute Rate Control Agents

Beta-blockers are the preferred agents for rate control. Beta-blockers control heart rate at rest and with exercise, and also provide cardioprotective benefits. They may be used with caution with asthma or chronic obstructive pulmonary disease (COPD).

Calcium channel blockers are second line rate control agents when beta-blockers are contraindicated. Calcium channel blockers control heart rate at rest and with exercise, but may exacerbate CHF. Beta-blockers are preferred for patients with A Fib and CHF. Calcium channel blockers should not be administered in the presence of wide QRS/WPW/preexcitation.

Concomitant use of a beta-blocker with a calcium channel blocker can, in rare circumstances, cause profound negative dromotropic, chronotropic and inotropic effects. These effects may be further exacerbated by type I or type III antiarrhythmic agents or underlying structural heart disease.

Digoxin is a third-line agent for rate control. Digoxin does not lower blood pressure and has a positive inotropic effect, but works more slowly than beta- blockers and calcium channel blockers, has no effect on the sympathetically mediated enhancement of AV node conduction

during exercise and is no better than placebo for conversion to normal sinus rhythm. Digoxin should not be administered with wide QRS/WPW/preexcitation, hypokalemia, hypomagnesemia, and renal impairment.

If ventricular response remains rapid despite attempts to control rate with beta-blockers, calcium channel blockers, and/or digoxin, consultation from a physician with cardiology expertise is recommended. Treatment options include immediate cardioversion if the risk of thromboembolism is acceptable or radiofrequency ablation of the AV node/HIS bundle followed by placement of a permanent pacemaker. It should be emphasized that the latter approach is irreversible and the patients are markedly pacemaker dependent, but it may be the preferred treatment for patients with rapid ventricular response resulting in hemodynamic instability.

Evidence supporting this recommendation is of classes: A, R

Refer to the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement (ICSI) Diagnosis and Treatment of Chest Pain and Acute Coronary Syndrome (ACS) guideline for further information and discussion.

5. Assess

Key Points:

- Reversible causes of A Fib/A Flutter should be sought in new arrhythmias.
- Exacerbating disease states should be evaluated and treated.

Patients presenting with a first detected episode of A Fib/A Flutter should be assessed with:

- chest x-ray
- echocardiogram

Patients presenting with a first detected episode of A Fib/A Flutter or with difficult rate control or with unexpected recurrence after cardioversion should also have:

- thyroid function tests

In addition, all patients with A Fib/A Flutter should be assessed for:

A. Potentially reversible causes of A Fib/A Flutter

Cardiac

- AV node reentry/paroxysmal supraventricular tachycardia (PSVT)

- accessory pathway/Wolf-Parkinson-White (WPW) syndrome
- pericarditis
- mitral valve disease

Pulmonary

- carbon monoxide poisoning
- hypoxia
- pulmonary embolus
- obstructive sleep apnea/hypopnea

Metabolic

- postoperative state/high catecholamine state
- hyperthyroidism

Drugs

- medications including antiarrhythmic and anticholinergic
- illicit drugs including phencyclidine (PCP), cocaine and other stimulants
- alcohol

B. Comorbidities
- acute MI or unstable coronary syndrome
- CHF
- congenital heart disease including hypertrophic cardiomyopathy
- WPW
- hypertension
- COPD

C. Risk Factors for Bleeding
- age 80 or older
- unstable gait
- alcohol abuse
- potential trauma
- recent gastrointestinal (GI)/genitourinary (GU) bleeding
- uncontrolled hypertension (>180 systolic or>100 diastolic)
- previous intracranial hemorrhage
- renal, liver disease

In patients who are at moderate risk for bleeding, current trends favor use of anticoagulation in light of the defined benefits for anticoagulation and poorly defined criteria for bleeding risk.

For a detailed discussion of assessing risk factors for bleeding, refer to the NGC summary of the ICSI Anticoagulation Therapy Supplement guideline.

D. Risk Factors for Thromboembolism

Very High Risk:

- previous thromboembolic event (cerebrovascular accident [CVA], transient ischemic attack [TIA], arterial embolus)
- rheumatic heart disease

High Risk:

- age greater than 75 years
- history of hypertension
- left ventricular dysfunction (moderate to severe wall motion abnormality assessed globally by 2-dimensional echocardiography, reduced ejection fraction, fractional shortening less than 0.25 by M-mode echocardiography or clinical heart failure).
- more than one intermediate risk factor

Intermediate Risk:

- age 65-75 years
- diabetes
- coronary artery disease
- thyrotoxicosis

Low Risk:

- absence of any of the risk factors listed above

E. Special Situations
- perioperative period
- acute MI
- preexcitation
- hypertrophic cardiomyopathy
- pulmonary diseases
- hyperthyroidism
- pregnancy

F. Initial tests for first known episode of A Fib
- chest x-ray
- echocardiogram
- thyroid function test if first known episode of A Fib or A Flutter, when the ventricular rate is difficult to control, or when the A Fib or A Flutter recurs unexpectedly after cardioversion

Evidence supporting this recommendation is of class: R

6. Label

Label (classify) patients into 1 of 4 categories:

A. First Detected Episode, Duration Known <48 hours

B. First Detected Episode, Duration Known ≥48 hours or Duration Unknown
C. Recurrent A Fib
    - paroxysmal spontaneously terminated recurrent A Fib
    - persistent sustained A Fib
    - permanent sustained A Fib greater than 1 year

D. Recurrent A Flutter

Treatment options are determined by these 4 categories.

8. First Detected Episode Duration Known <48 hours: Treatment Options

Key Points:

- Patients presenting with new onset atrial fibrillation of known duration less than 48 hours may be managed initially with either observation (in hopes of spontaneous conversion to sinus rhythm) or cardioversion.
- To minimize the effects of electrical and mechanical remodeling associated with atrial fibrillation, and to minimize thromboembolic complications, most patients with new onset atrial fibrillation of known duration less than 48 hours that do not undergo spontaneous conversion to sinus rhythm should undergo electrical or chemical cardioversion.
- Electrical cardioversion can successfully convert more than 90% of patients to sinus rhythm but carries the risks associated with intravenous sedation.
- Chemical cardioversion with antiarrhythmics offers lower success rates than electrical cardioversion and may occasionally be complicated by more serious arrhythmias, but is an appropriate choice for patients not well suited to electrical cardioversion.

A. Observation with reevaluation 24 hours

Restoring sinus rhythm has been shown to improve both ejection fraction and exercise capacity as well as to reduce symptoms. Spontaneous conversion to sinus rhythm is observed in up to 48% of patients with recent onset (within 24 hours) A Fib. Therefore, observation within the first 24 hours of onset is a reasonable option. However, if the patient does not spontaneously convert back to sinus rhythm, DC cardioversion or antiarrhythmics/chemical cardioversion are recommended. Though DC cardioversion requires conscious sedation, pharmacologic cardioversion is less effective and may cause serious arrhythmias including torsades de pointes (TDP). The risk of thromboembolic complications does not differ between pharmacologic and DC cardioversion. Therefore, recommendations for anticoagulation are the same for both methods. Anticoagulation is generally not required when the duration of A Fib or A Flutter is known to be less than 48 hours. However, anticoagulation should be strongly considered prior to and following cardioversion for all patients regardless of the duration of A Fib or A Flutter with:

- rheumatic mitral valve disease
- spontaneous echo contrast in left atrium or left atrial appendage
- prior thromboembolism

Evidence supporting this recommendation is of classes: D, R

B. DC Cardioversion

DC cardioversion has been used to treat a variety of rhythm disturbances including A Fib and A Flutter since the early 1960s. The success of external DC cardioversion depends on patient selection and cardioversion technique. Success rates range from 65 to 95%. Success of cardioversion is increased if the left atrium is less than 60 mm (3 cm/m^2 body surface area [BSA]) and if the arrhythmia is of short duration.

Transthoracic cardioversion of A Fib may now be performed with biphasic waveform defibrillation. It typically uses less energy and may have greater efficacy than monophasic waveforms.

A recent study has shown that an A-P paddle position is superior to an anterior-lateral position in success of cardioversion. The A-P position also required lower energy levels for success. If the first position is unsuccessful, paddle relocation should be considered.

Complications of DC cardioversion are uncommon but include embolization, pulmonary edema, and arrhythmias including ventricular fibrillation and asystole. DC cardioversion should be avoided in patients with known or suspected digoxin toxicity. It is unnecessary to interrupt digoxin therapy for cardioversion in patients without manifestations of toxicity.

See the original guideline document for specifics on DC cardioversion technique and information on comparing electrical and chemical cardioversion.

Evidence supporting this recommendation is of classes: A, D, R

C. Antiarrhythmic/Chemical Cardioversion

All antiarrhythmics used to treat A Fib/A Flutter can cause serious complications including the life-threatening arrhythmia torsades de pointes in up to 8% of patients. Therefore, antiarrhythmics should be initiated in the presence of a physician or nurse with expertise in the administration of antiarrhythmics with telemetry monitoring for at least 4 hours, or longer if QT remains prolonged.

Risk factors for proarrhythmia include:

- Preexisting bradycardia or atrioventricular (AV) block

- Underlying structural heart disease
- Active CHF or ischemia- hypokalemia or hypomagnesemia
- Drug dosages (e.g., lower doses for quinidine and higher doses for sotalol)

Pharmacologic therapy aimed at restoring sinus rhythm is often helpful in patients with A Fib. Conversion is much more common in patients with A Fib of less than 48 hours duration as conversion rates drop off considerably after this time.

As a general rule, regardless of the agent or route used, the conversion rate of A Fib of less than 48 hours duration is 60-90%. Conversion rates drop to 15-30% if present 48 hours or longer. Successful conversion of A Flutter is generally higher than for A Fib.

Agents that have been studied for conversion of A Fib to sinus rhythm include quinidine, procainamide, propafenone, flecainide, sotalol, ibutilide, and amiodarone. No single agent has emerged as the drug of choice for acute conversion of A Fib. Ibutilide is available only in the intravenous (IV) form and has been approved by the Food and Drug Administration (FDA) specifically for this purpose. All other agents used for acute pharmacologic conversion of A Fib are done "off-label."

Reported success rates vary in part because of the heterogeneity of patient populations - particularly with respect to the duration of A Fib in the published trials. Of the intravenous agents, only ibutilide is approved by the FDA for this indication.

Refer to Annotation #18, Table 11, "Antiarrhythmic Agents" in the original guideline document for more information on antiarrhythmic agents.

Ibutilide has been studied extensively for the conversion of recent onset A Fib and A Flutter. Efficacy rates between 30%-40% have been quoted in acute reversal of recent onset A Fib. Generally patients convert within 30 minutes. Significant adverse effect of TDP was noted in 4.3% of patients, 1.7% requiring electrical termination. There were no deaths or severe morbidities.

Refer to Figure 3 in the original guideline document for more information on use of ibutilide.

Proarrhythmia associated with initiation of membrane antiarrhythmic agents relates to the presence of underlying structural heart disease as well as the type of drug initiated. The drugs sotalol, dofetilide, and quinidine should be initiated in all patients under telemetry guidance. These drugs should not be allowed to prolong QTc (similar to sotalol and dofetilide) to longer than 500 ms.

Amiodarone, the other class III drug, is the subject of several articles regarding its efficacy in conversion of recent onset and permanent A

Fib. Amiodarone is effective in converting A Fib both acutely and chronically. It has be been studied for both the oral and intravenous routes. Amiodarone can be started at maintenance doses in the outpatient setting; when high-dose loading is required or the drug is initiated in patients with structural heart disease, hospitalization should be advised. The Class I-C drugs propafenone and flecainide can also be initiated in the outpatient setting with appropriate follow-up of QRS duration that should not lengthen longer than 25%. For patients with structural heart disease, these agents should also be initiated in the inpatient setting. A new Class III agent, azimilide, may enhance future flexibility in the outpatient initiation of antiarrhythmic agents.

Oral flecainide (300 mg single dose) has similar conversion rates compared to oral propafenone (600 mg single dose) when used in patients with A Fib of acute onset (approximately 72-78% conversion rate at 8 hours).

Evidence supporting this recommendation is of classes: A, D, R

Failed Cardioversion Treatment Options

If initial attempts to restore normal sinus rhythm from first detected A Fib fail, cardioversion can be repeated following a parenteral or oral loading dose of an appropriate antiarrhythmic agent. However, this approach should be avoided in patients with ejection fractions less than 30% because of the increased risk of torsades de pointes.

Furthermore, it should be noted that this is not a strategy to maintain normal sinus rhythm but only a means to enhance conversion back to sinus rhythm. Appropriate anticoagulation practices are required prior to and following cardioversion if the duration of A Fib exceeds 48 hours. If A Fib continues despite these attempts, cardiology consultation is advised.

The patient and/or physician may also opt for chronic anticoagulation and chronic rate control at this point - though the general consensus is that most patients with a first episode of A Fib or A Flutter have a high likelihood of successful conversion back to normal sinus rhythm.

Transthoracic cardioversion of A Fib may be achieved by applying biphasic waveform for defibrillation. It has been shown to be equally effective and to use less energy than monophasic waveforms.

Evidence supporting this recommendation is of class: A, R

10. First Detected Episode Duration Known $\geq$48 Hours or Duration Unknown: Treatment Options

Key Points:

- Anticoagulation with warfarin (INR $\geq$2.0 for 3 weeks) is required before electrical or pharmacologic cardioversion back to sinus rhythm

- TEE-guided cardioversion without traditional precardioversion anticoagulation cannot be routinely recommended
- Amiodarone is probably the most effective antiarrhythmic drug for maintenance of NSR; but, it also carries with it the highest potential for noncardiac toxicity, and requires regular follow-up
- Angiotensin-converting enzyme (ACE)-inhibitor and angiotensin receptor blocker (ARB) therapies may have an emerging role as adjuncts to antiarrhythmic therapy for maintenance of NSR.
- Ximelagatran (has not received FDA approval at this time) may simplify chronic anticoagulation management in the future.

General Recommendations

When the duration of A Fib or A Flutter exceeds 48 hours or is unknown, the risk of thromboembolic complications is as high as 7% following cardioversion without anticoagulation. Thus, in this setting, anticoagulation with warfarin is required (INR $\geq$2.0 for 3 consecutive weeks) prior to electrical cardioversion. Though not a consistent clinical practice, the American College of Chest Physicians (ACCP) also recommends anticoagulation with warfarin (INR $\geq$2.0 for 3 consecutive weeks) prior to the initiation of antiarrhythmics.

As A Fib persists for longer periods of time, the efficacy of pharmacologic cardioversion decreases. Though DC cardioversion requires conscious sedation, pharmacologic cardioversion is less effective and may cause serious arrhythmias including torsades de pointes. Antiarrhythmics like ibutilide or propafenone may be administered prior to DC cardioversion to increase the likelihood of its success.

Alternatively, the patient and/or physician may also opt for chronic rate control (see Annotation #12) and chronic anticoagulation (see Annotation #13). However, if this represents the first episode of persistent atrial fibrillation for the patient, there is general consensus that most patients deserve one trial of conversion back to normal sinus rhythm, given the high likelihood of initial success.

Evidence supporting this recommendation is of classes: A, D

Specific Anticoagulation Issues

Whenever possible, cardioversion should be undertaken with conventional anticoagulation prior to and following cardioversion.

When anticoagulation is temporarily contraindicated (such as acute gastrointestinal [GI] bleeding), cardioversion should be delayed if possible until appropriate anticoagulation can be given prior to and following cardioversion.

When anticoagulation is contraindicated and cardioversion cannot be delayed, transesophageal echocardiography (TEE) may identify high-risk patients but may not change therapeutic decisions.

However, if TEE is used to guide anticoagulant therapy, the patient must be anticoagulated with therapeutic (not prophylactic) levels of heparin and warfarin. Heparin should be continued until the INR is greater than or equal to 2.0 for 2 consecutive days. Warfarin should be continued a minimum of four weeks following successful cardioversion.

At this time, there is insufficient evidence to recommend routine TEE to guide anticoagulant therapy prior to or following cardioversion [Conclusion Grade III] (See Conclusion Grading Worksheet Appendix A Annotation #10 in the original guideline document.)

There is no experience reported on the use of low-molecular-weight heparins prior to or following cardioversion (with or without TEE). A pilot study of TEE-guided enoxaparin plus warfarin versus TEE-guided unfractionated heparin plus warfarin (ACUTE II) is in progress. Unfortunately, this trial does not include a conventional therapy group, which is a significant omission in light of the ACUTE trial results.

A new direct oral thrombin inhibitor (which has not received FDA approval at this time), ximelagatran, has been studied in the SPORTIF III trial, randomized against warfarin in patients with non-valvular AF. The drug was found to be equivalent for prevention of systemic thromboembolism and had a lower risk of major/minor bleeding. Given the drug doesn't require INR monitoring, it may have a promising role in the future for AF patients.

For additional information on anticoagulation with warfarin, refer to the NGC summary of the ICSI Anticoagulation Therapy Supplement guideline.

Evidence supporting this recommendation is of classes: A, C, D, M, R

Maintenance of Sinus Rhythm Following Conversion

Several antiarrhythmic drugs have been demonstrated to improve sinus rhythm maintenance following cardioversion, including amiodarone, propafenone, disopyramide, sotalol, flecainide, dofetilide, and quinidine. Amiodarone has been shown to be the single most effective agent of the lot, although it also contributes the most to noncardiac drug related toxicity. When administered at 800 mg per day for 2 weeks prior to elective cardioversion, amiodarone chemically converts one-fifth of patients with persistent AF, and when continued for 8 weeks at 200 mg per day, doubled the number of patients in NSR at that time. Both the ACE inhibitor, enalapril, and angiotensin receptor blocker, irbesartan, have been demonstrated to enhance the maintenance of NSR after cardioversion when added to amiodarone.

Evidence supporting this recommendation is of class: A

12. Assess Patients for Anticoagulation Agents

Key Point:

- All patients with paroxysmal, persistent, or permanent A Fib should be assessed for chronic anticoagulation, balancing the long-term risk of thromboembolism against the long-term risk of bleeding.

Patients with either paroxysmal or persistent A Fib may benefit from anticoagulation. The long-term risk of thromboembolic complications must be balanced against the long-term risk of bleeding. The risk factors for thromboembolism and the risk factors for bleeding are detailed in Annotation #5, "Assess."

For additional information on anticoagulation, refer to the NGC summary of the ICSI Anticoagulation Therapy Supplement guideline.

Evidence supporting this recommendation is of classes: A, C, R

13. Assess Patient for Rate Control Agents

Key Point:

- Drugs that can be used for rate control of chronic AF include: beta-blockers, calcium blockers, digitalis, and clonidine.

Beta-blockers or nondihydropyridine calcium blockers are the initial choices for pharmacologic rate control. Beta-blockers control heart rate at rest and with exercise and also provide cardioprotective benefits. They may be used with caution with asthma or COPD.

Calcium channel blockers are second line rate control agents when beta-blockers are contraindicated. Calcium channel blockers control heart rate at rest and with exercise but may exacerbate CHF. Beta- blockers are preferred for patients with A Fib and CHF. Calcium channel blockers should not be administered in the presence of wide QRS/WPW/preexcitation.

Concomitant use of a beta-blocker with a calcium channel blocker can, in rare circumstances, cause profound negative dromotropic, chronotropic and inotropic effects. These effects may be further exacerbated by type I or type III antiarrhythmic agents or underlying structural heart disease.

Digoxin is a third-line agent for rate control. Digoxin can be utilized for patients with significant systolic CHF, but is inferior for exercise rate to the other agents. Digoxin does not lower blood pressure and has a positive inotropic effect, but works more slowly than beta-blockers and calcium channel blockers, has no effect on the sympathetically mediated enhancement of AV node conduction during exercise, and is no better than placebo for conversion to normal sinus rhythm. Digoxin should not be administered with wide QRS/WPW/preexcitation, hypokalemia, hypomagnesemia, and renal impairment.

Clonidine can also be given as a single agent or in conjunction with others, blocking AV conduction through its decrease on CNS sympathetic efferent nerve traffic. For the less than 10% of patients who do not achieve adequate

rate control with drugs, AV nodal ablation with pacing offers a nonpharmacologic alternative.

Evidence supporting this recommendation is of class: A

Refer to Table 9 in the original guideline document for more information on medications used for rate control.

15. Rate Adequately Controlled?

Key Point:

- Adequate AF rate control should be assessed both at rest and exercise to eliminate symptoms and prevent the development of heart failure from tachycardia-induced cardiomyopathy.

Adequate rate control may help relieve symptoms including palpitations, chest pain, dyspnea, fatigue, or lightheadedness. Also, tachycardia-induced cardiomyopathy (TICM) is an important reversible complication of inadequate rate control. TICM can produce symptomatic congestive heart failure, thromboembolic complications, and potentially fatal ventricular arrhythmias. Thus, it is essential to maintain adequate rate control both at rest and during exercise. Patients with an acute MI or acute coronary symptoms may require lower ventricular rates to decrease myocardial oxygen demand and limit infarction size.

At rest, the heart rate should be similar to individuals in sinus rhythm less than 80-90 beats per minute (bpm). During exercise, the maximum rate should be no greater than the maximum set for individuals in sinus rhythm [0.7 x (220-age)] and should not be reached during light exercise. A 6-minute office walk, exercise stress test can assess this, or Holter monitor (24 hour average < 100 bpm).

Evidence supporting this recommendation is of class: A

16. Symptoms Adequately Controlled?

Key Point:

- For the older patient over 65 years of age, rate control is an equal strategy to rhythm control for long-term management of AF.

The goals of therapy in the management of AF include relief of symptoms, prevention of stroke, and prevention of tachycardia-mediated cardiomyopathy. Recently published studies (AFFIRM/RACE) examined outcomes in patients randomized to a rate control strategy versus a strategy of restoration and attempted maintenance of sinus rhythm using antiarrhythmic drugs and cardioversion. Strategies aimed at maintaining sinus rhythm offered no significant advantages over rate control strategies, but were associated with a higher incidence of hospitalization and adverse drug effects. The important role of warfarin anticoagulation for prevention of

stroke are well established and again demonstrated in these trials. Early discontinuation of anticoagulation and sub-therapeutic anticoagulation were factors associated with thromboembolic events. These trials indicate that a rate control strategy is acceptable, particularly in older patients who are asymptomatic or minimally symptomatic.

Patients presenting with paroxysmal or persistent AF should be assessed for symptoms and for underlying cardiac disease. Restoration of sinus rhythm with cardioversion and/or suppression of AF with antiarrhythmic drugs are a reasonable initial strategy particularly in younger patients. Patients should be reassessed for symptoms, side effects of treatment and recurrence of AF with potential reconsideration of rate control strategy if appropriate. Patient with significant symptoms associated with AF may warrant repeated trials with antiarrhythmic drugs possibly in combination with permanent pacing. Ablative therapies for symptomatic atrial fibrillation refractory to pharmacological management are an emerging and promising therapy.

There is no observed survival advantage to strategies aimed at restoring sinus rhythm over strategies to control rate in older patients with relatively asymptomatic atrial fibrillation based on the limited data available from studies which have compared these strategies. [Conclusion Grade II: See Conclusion Grading Worksheet Appendix B Annotation #12 (Rhythm Versus Rate Control) in the original guideline document].

Evidence supporting this recommendation is of classes: A, R

18. Referral for Treatment Options

Key Points:

- Patients with recurrent atrial fibrillation should be reassessed for symptoms during atrial fibrillation, side effects to treatment and review of past therapeutic results to plan future therapy.
- Antiarrhythmic agents used for atrial fibrillation suppression are chosen based on risk of proarrhythmia related to underlying heart disease and potential side effects. Drugs should be used in adequate doses with the reduction of the frequency and severity of symptomatic atrial fibrillation episodes as the primary treatment goal.
- Cardiac pacing may allow the use of antiarrhythmic drugs that are contraindicated due to bradycardia and also may provide definitive rate control when coupled with His ablation in patients with poorly controlled ventricular response.
- Isthmus-dependent atrial flutter can be readily controlled with radiofrequency ablation.
- Catheter based and surgically based pulmonary vein isolation procedures show great promise in the suppression of atrial fibrillation with better outcomes expected as techniques and experience develop.

A. Intermittent Cardioversion
    - Intermittent electrical or chemical cardioversion may be considered for:
        - Infrequent recurrences

        - Hemodynamic instability (see Annotation #4A, "Hemodynamic Stabilization")
        - Failure of an antiarrhythmic agent
    - Evaluate for potentially reversible causes.
    - Assess for chronic anticoagulation.
    - Future treatment option: implantable atrial defibrillator

B. Antiarrhythmics

Antiarrhythmic agents should be individualized for the patients anticipated proarrhythmia risks, based on underlying cardiac conditions and other comorbidities while attempting to minimize organ toxicity.

Refer to Table 10 in the original guideline document for information on selection of antiarrhythmic agent by type of condition.

C. Electrophysiology Consult

Nonpharmacologic treatment modalities for patients requiring such therapy have expanded in the last decade and include ablation, pacing, implantable defibrillation, and surgery.

Options:

- Cardiac pacing
  Single site atrial pacing
  Dual site atrial pacing
  Implantable cardioverter-defibrillator (ICD)
- Catheter based ablative therapies
  HIS bundle ablation and permanent pacemaker implantation
  Atrial flutter ablation
  Pulmonary vein isolation for A Fib suppression
- Surgical ablative therapies
  Maze
  Modified maze procedure

Evidence supporting this recommendation is of classes: A, C, D, R

Refer to the original guideline document for more information on these options.

21. Patient Education

Key Points:

- Patient education is essential for the successful management of A Fib and A Flutter.
- Education should begin at the time of diagnosis, and should occur and be documented at every visit.

- An important part of patient education is defining expectations chronicity of disease, empiric treatment, and frequent recurrences despite therapy.

Patient education is essential for the successful management of A Fib and A Flutter. Patients should be encouraged and empowered to play an active role in the self-management of their disease. Self-management is best initiated and sustained through an education partnership between the patient and the multidisciplinary health care team.

Education should begin at the time of diagnosis and should occur and be documented at every visit.

Best patient education should include:

- description of what A Fib/A Flutter is, including its causes
- symptoms
- risks associated with untreated A Fib
- review of individual treatment plan
- medication education
- reason for taking medication and action
  how to take
  side effects
  drug interactions
- how to take a pulse
- when to call the clinic

A Fib in and of itself is not a life threatening arrhythmia provided proper anticoagulation is used to prevent thromboembolic complications.

Additional key patient education components for patients on warfarin:

1. Mechanism of action of warfarin: it depletes certain anticoagulation factor proteins in the blood.
2. Time of day to take warfarin: it should be taken at approximately the same time and is taken in the evening. Due to the short half-life of factor VII and its influence on the INR, this is especially important if a patient will have an INR drawn the next morning.
3. Explanation of INR, target range, and regular testing
4. Signs and symptoms of bleeding and that the provider should be contacted immediately if bleeding signs are present
5. Need to notify provider if illness, injury, or change in physical status occurs
6. Need to inform all their health care providers that the patient is on anticoagulation therapy, especially if the patient is potentially undergoing an invasive procedure, surgery, or dental work
7. Drug interactions:
    - What to do if a new medication is initiated or a medication is discontinued, especially if the interaction with warfarin in unknown: check INR within 3 to 4 days
    - Drugs that affect the absorption of warfarin

- Drugs that increase or decrease the effect of warfarin
- Common over-the-counter medication interactions including aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, natural or herbal remedies, laxatives, antacids, and multivitamin preparations containing vitamin K

8. Role of vitamin K and the importance of consistency of vitamin K-rich foods in the diet rather than avoidance of vitamin K-rich foods
9. Importance of minimizing trauma risk associated with activities at high risk for injury
10. Effect of exercise: increased activity results in decreased effect of the drug
11. Effect of personal habits: alcohol, chewing tobacco, etc.
12. Effect of certain conditions: congestive heart failure, thyroid disease, gastroenteritis, and diarrhea
13. Importance of self-monitoring: maintain a log of INRs, dose of warfarin, etc.
14. Medic Alert bracelet/necklace and warfarin ID card

Evidence supporting this recommendation is of class: R

Definitions:

Conclusion Grades:

Grade I: The evidence consists of results from studies of strong design for answering the question addressed. The results are both clinically important and consistent with minor exceptions at most. The results are free of any significant doubts about generalizability, bias, and flaws in research design. Studies with negative results have sufficiently large samples to have adequate statistical power.

Grade II: The evidence consists of results from studies of strong design for answering the question addressed, but there is some uncertainty attached to the conclusion because of inconsistencies among the results from the studies or because of minor doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from weaker designs for the question addressed, but the results have been confirmed in separate studies and are consistent with minor exceptions at most.

Grade III: The evidence consists of results from studies of strong design for answering the question addressed, but there is substantial uncertainty attached to the conclusion because of inconsistencies among the results of different studies or because of serious doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from a limited number of studies of weak design for answering the question addressed.

Grade Not Assignable: There is no evidence available that directly supports or refutes the conclusion.

Classes of Research Reports:

A. Primary Reports of New Data Collection:

Class A:

- Randomized, controlled trial

Class B:

- Cohort study

Class C:

- Nonrandomized trial with concurrent or historical controls
- Case-control study
- Study of sensitivity and specificity of a diagnostic test
- Population-based descriptive study

Class D:

- Cross-sectional study
- Case series
- Case report

B. Reports that Synthesize or Reflect upon Collections of Primary Reports:

Class M:

- Meta-analysis
- Systematic review
- Decision analysis
- Cost-effectiveness analysis

Class R:

- Consensus statement
- Consensus report
- Narrative review

Class X:

- Medical opinion

CLINICAL ALGORITHM(S)

A detailed and annotated clinical algorithm is provided for Atrial fibrillation.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The guideline contains an annotated bibliography and discussion of the evidence supporting each recommendation. The type of supporting evidence is identified and classified for selected recommendations (see "Major Recommendations").

In addition, key conclusions contained in the Work Group's algorithm are supported by a grading worksheet that summarizes the important studies pertaining to the conclusion. The type and quality of the evidence supporting these key recommendations (i.e., choice among alternative therapeutic approaches) is graded for each study.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Atrial fibrillation (A Fib) is a common arrhythmia and an important independent risk factor for stroke. Potential benefits of guideline implementation include the following:

- Improved patient understanding of the disease and treatment
- Reduction or abolishment of any underlying disorder
- Improvement in quality of life, including reduction in symptoms and reduction in complications of atrial fibrillation (A Fib) and atrial flutter (A Flutter)
- Minimization of treatment adversity
- Prolonged life
- Decreased or minimized hospitalization/length of stay
- Increased percentage of patients with A Fib who receive patient education
- Improved rate control in patients with permanent A Fib

  Success rates of electrical cardioversion range are greater than 90%. Success rates of chemical cardioversion are equal to or greater than 40%.

POTENTIAL HARMS

All antiarrhythmics used to convert atrial fibrillation (A Fib)/atrial flutter (A Flutter) to sinus rhythm can cause serious complications, including life-threatening torsades de pointes (TDP) in up to 8% of patients.

Risk factors for proarrhythmia include:

- Preexisting bradycardia or atrioventricular block
- Underlying structural heart disease
- Active congestive heart failure (CHF) or ischemia-hypokalemia or hypomagnesemia
- Drug doses (e.g., lower doses for quinidine and higher doses for sotalol)

Side effects for rate control agents include:

- Beta-blockers may cause or worsen bronchospasm in patients with asthma or chronic obstructive pulmonary disease (COPD).
- Beta-blockers, calcium channel blockers, and digoxin should not be administered to patients with wide QRS/Wolff-Parkinson-White

(WPW)/preexcitation. These drugs can cause accelerated conduction over the bypass tract with the risk of deteriorating to ventricular fibrillation.
- Concomitant use of a beta-blocker with a calcium channel blocker can, in rare circumstances, cause profound negative dromotropic, chronotropic, and inotropic effects. These effects may be further exacerbated by type I or type III antiarrhythmic agents or underlying structural heart disease.
- When administering any rate control agent, caution must be taken if there is any evidence of sick sinus syndrome, other conduction system disease, or structural heart disease.

Other potential adverse reactions and interactions to rate control medications include the following:

Beta-blockers, such as atenolol (Tenormin®), metoprolol (Lopressor®), propranolol (Inderal®), esmolol (Brevibloc®)

- Adverse reactions: Bradycardia, hypotension, atrioventricular block, and precipitation of CHF.
- Precautions: Obstructive lung disease, diabetes, severe peripheral vascular disease, and CHF. Beta-blockers should not be discontinued abruptly.
- Drug interactions: Calcium channel blockers and antiarrhythmics can contribute to negative inotropic and chronotropic effects. Digoxin contributes to negative chronotropic effects. The combination of a calcium channel blocker and a beta-blocker should only be considered in rare circumstances.

Calcium channel blockers, such as, verapamil and diltiazem (Cardizem®)

- Adverse reactions: Bradycardia, hypotension, atrioventricular block, precipitation of CHF, constipation (verapamil).
- Precautions: CHF, patients with WPW.
- Drug interactions: Beta-blockers and antiarrhythmics can contribute to negative inotropic and chronotropic effects. Digoxin contributes to negative chronotropic effects. Increased digoxin levels (especially verapamil), carbamazepine, rifampin, lithium, theophylline, cyclosporine, phenobarbital, cimetidine, and propranolol.

Digoxin (Lanoxin®)

- Adverse reactions: Nausea and visual disturbances (signs of toxicity).
- Precautions: Renal impairment (requires dosage adjustment), patients with WPW, hypokalemia and low magnesium (predisposes to arrhythmias).
- Drug interactions: Cholestyramine and colestipol, antacids, verapamil (and diltiazem), quinidine, amiodarone, flecainide, propafenone.

Clonidine

- Adverse reactions: Dry mouth, constipation, drowsiness and sedation.
- Precautions: Clonidine should not be discontinued abruptly.

Other potential adverse reactions and interactions to antiarrhythmic medications include the following:

Quinidine

- Adverse reactions: Nausea and diarrhea, cinchonism with high levels (tinnitus and blurred vision), torsades, thrombocytopenia, and lupus.
- Precautions: Hypotension (especially with intravenous administration, and intravenous administration is discouraged). Rate control is recommended prior to administration.
- Drug interactions: Digoxin, warfarin, phenytoin, phenobarbital, amiodarone.

Procainamide

- Adverse reactions: Nausea and vomiting, lupus, agranulocytosis.
- Precautions: Renal impairment (requires dosage adjustment). Rate control is recommended prior to administration.
- Drug interactions: Amiodarone, cimetidine

Disopyramide (Norpace®)

- Adverse reactions: Negative inotropic effects, significant anticholinergic effects (dry mouth, blurred vision, urinary retention, constipation), and nausea.
- Precautions: Renal impairment (requires dosage adjustment), urinary retention. Rate control is recommended prior to administration.
- Drug interactions: Warfarin, erythromycin, clarithromycin.

Flecainide (Tambocor®)

- Adverse reactions: Negative inotropic effects, dizziness, headache, fatigue, visual disturbances, and nausea.
- Precautions: Avoid in patients with poor left ventricular (LV) function, ischemic heart disease, and major conduction disturbances. Renal impairment requires dosage adjustment. Rate control is recommended prior to administration.
- Drug interactions: Cimetidine, amiodarone, digoxin, and propranolol

Propafenone (Rythmol®)

- Adverse reactions: Nausea, vomiting, and constipation, dizziness, fatigue, and headache, blurred vision, positive antinuclear antibodies.
- Precautions: Avoid in patients with poor LV function, ischemic heart disease, and major conduction disturbances, asthma/bronchospastic disease.
- Drug interactions: Digoxin, quinidine, warfarin, cimetidine, theophylline, rifampin, phenobarbital, cyclosporine, ritonavir, grapefruit juice

Amiodarone (Cordarone®)

- Adverse reactions: Pulmonary fibrosis, hepatic dysfunction, hypothyroidism and hyperthyroidism, photosensitivity, skin discoloration, fatigue, nausea, vomiting, constipation, ocular effects.
- Drug interactions: Digoxin, quinidine, procainamide, flecainide, warfarin, phenytoin.

Sotalol (Betapace®)

- Adverse reactions: Torsades, fatigue, dizziness, worsening congestive heart failure, dyspnea, nausea and vomiting, visual disturbances.
- Precautions: Avoid in patients with poor LV function, renal impairment requires dosage adjustment, asthma (beta-blocking effects).

Ibutilide (Covert®)

- Precautions: Proarrhythmia (torsades). Requires a monitored setting.

Dofetilide (Tikosyn®)

- Precautions: Proarrhythmia (torsades). Requires a hospital setting for 3 days. Available only to hospitals and prescribers who have received appropriate dosing and treatment initiation education.

Anticoagulant medication: Bleeding is the major side effect. For more information, see the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement (ICSI) Anticoagulation Therapy Supplement guideline.

Complications of electrical (DC) cardioversion include embolization and, more rarely, pulmonary edema and arrhythmias including ventricular fibrillation and asystole. DC cardioversion should be avoided in patients with known or suspected digoxin toxicity.

CONTRAINDICATIONS

CONTRAINDICATIONS

Contraindications to chemical cardioversion include:

- Hemodynamic instability
- Acute coronary ischemia
- Marked bradycardia
- QTc $\geq$460 msec
- Marked left ventricular hypertrophy
- Marked left ventricular failure
- Hypokalemia
- Hypomagnesemia
- Currently on an antiarrhythmic

Relative contraindications to DC cardioversion include:

- Fresh chest wound
- Fear of DC cardioversion

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These clinical guidelines are designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and are not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition. A guideline will rarely establish the only approach to a problem.
- This clinical guideline should not be construed as medical advice or medical opinion related to any specific facts or circumstances. Patients are urged to consult a health care professional regarding their own situation and any specific medical questions they may have.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Once a guideline is approved for release, a member group can choose to concentrate on the implementation of that guideline. When four or more groups choose the same guideline to implement and they wish to collaborate with others, they may form an action group.

In the action group, each medical group sets specific goals they plan to achieve in improving patient care based on the particular guideline(s). Each medical group shares its experiences and supporting measurement results within the action group. This sharing facilitates a collaborative learning environment. Action group learnings are also documented and shared with interested medical groups within the collaborative.

Currently, action groups may focus on one guideline or a set of guidelines such as hypertension, lipid treatment, and tobacco cessation.

Detailed measurement strategies are presented in the original guideline document to help close the gap between clinical practice and the guideline recommendations. Summaries of the measures are provided in the National Quality Measures Clearinghouse (NQMC).

IMPLEMENTATION TOOLS

Clinical Algorithm
Pocket Guide/Reference Cards
Quality Measures

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

RELATED NQMC MEASURES

- Atrial fibrillation: percentage of patients (without contraindications to anticoagulation) with paroxysmal, persistent, or permanent atrial fibrillation/atrial flutter (A Fib/Flutter) with risk factors for thromboembolism who are on warfarin.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Living with Illness

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Institute for Clinical Systems Improvement (ICSI). Atrial fibrillation. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2004 Nov. 60 p. [103 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000 Oct (revised 2004 Nov)

GUIDELINE DEVELOPER(S)

Institute for Clinical Systems Improvement - Private Nonprofit Organization

GUIDELINE DEVELOPER COMMENT

Organizations participating in the Institute for Clinical Systems Improvement (ICSI): Affiliated Community Medical Centers, Allina Medical Clinic, Altru Health System, Aspen Medical Group, Avera Health, CentraCare, Columbia Park Medical Group, Community-University Health Care Center, Dakota Clinic, ENT Specialty Care, Fairview Health Services, Family HealthServices Minnesota, Family Practice Medical Center, Gateway Family Health Clinic, Gillette Children's Specialty Healthcare, Grand Itasca Clinic and Hospital, HealthEast Care System, HealthPartners Central Minnesota Clinics, HealthPartners Medical Group and Clinics, Hutchinson Area Health Care, Hutchinson Medical Center, Lakeview Clinic, Mayo Clinic, Mercy Hospital and Health Care Center, MeritCare, Mille Lacs Health

System, Minnesota Gastroenterology, Montevideo Clinic, North Clinic, North Memorial Care System, North Suburban Family Physicians, Northwest Family Physicians, Olmsted Medical Center, Park Nicollet Health Services, Pilot City Health Center, Quello Clinic, Ridgeview Medical Center, River Falls Medical Clinic, Saint Mary's/Duluth Clinic Health System, St. Paul Heart Clinic, Sioux Valley Hospitals and Health System, Southside Community Health Services, Stillwater Medical Group, SuperiorHealth Medical Group, University of Minnesota Physicians, Winona Clinic, Ltd., Winona Health

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GUIDELINE COMMITTEE

Cardiovascular Steering Committee

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

In the interest of full disclosure, the Institute for Clinical Systems Improvement (ICSI) has adopted a policy of revealing relationships work group members have with companies that sell products or services that are relevant to this guideline topic. The reader should not assume that these financial interests will have an adverse impact on the content of the guideline. Readers of the guideline may assume that only work group members listed below have potential conflict of interest to disclose.

Thomas Munger, MD, received honoraria from Medtronic and Guidant, and received grant support from St. Jude Detect SVT Investigators.

David Dunbar, MD, received grant support from Medtronic.

Joseph Van Kirk, MD, has not returned disclosure information.

No other work group members have potential conflicts of interest to disclose.

ICSI's conflict of interest policy and procedures are available for review on ICSI's website at www.icsi.org.

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previously released version: Atrial fibrillation. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2003 Oct. 64 p.

GUIDELINE AVAILABILITY

Electronic copies: Available from the Institute for Clinical Systems Improvement (ICSI) Web site.

Print copies: Available from ICSI, 8009 34th Avenue South, Suite 1200, Bloomington, MN 55425; telephone, (952) 814-7060; fax, (952) 858-9675; Web site: www.icsi.org; e-mail: icsi.info@icsi.org.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ICSI pocket guidelines. April 2004 edition. Bloomington (MN): Institute for Clinical Systems Improvement, 2004. 404 p.

Print copies: Available from ICSI, 8009 34th Avenue South, Suite 1200, Bloomington, MN 55425; telephone, (952) 814-7060; fax, (952) 858-9675; Web site: www.icsi.org; e-mail: icsi.info@icsi.org.

PATIENT RESOURCES

None available

NGC STATUS

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